

**Remarks**

Claims 1-23 are currently pending. In the Office action dated April 19, 2005, claim 1 is rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent Application Publication No. 2002/0039550 to Shafer-Sindlinger et al. Claims 2 and 10 are rejected under 35 U.S.C. § 103(a) as being obvious over Shafer-Singlinger. Claims 6, 8, 9 and 23 are rejected under § 103(a) as obvious over Shafer-Sindlinger in view of U.S. Patent No. 5,357,749. Claims 16, 17 and 19 are rejected under the judicially-created doctrine of obviousness-type double patenting as being unpatentable over claims 8, 9 and 10 of U.S. Patent No. 6,701,707. Claims 11-15 are allowed, and claims 3-5, 7, 18 and 20-22 are indicated to be allowable if rewritten in independent form. Finally, claims 6-10, 17 and 19 are objected to for various informalities.

**Claim objections**

First, in response to the claim objections, applicants herein amend claim 6, as well as claim 1, to change the claim term "said second amount of NO<sub>x</sub>" to read "said amount of NO<sub>x</sub>". Additionally, applicants amend claim 19 to depend from claim 18. Applicants believe that these amendments overcome the stated claim objections.

**Rejections under § 102**

Next, applicants respectfully traverse the rejection of claim 1 as anticipated by Shafer-Sindlinger. A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Shafer-Sindlinger does not anticipate claim 1 because it does not either expressly or inherently

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describe each and every element of claim 1.

Claim 1 recites a method for controlling reductant injection in an exhaust system of an engine having an upstream oxidation catalyst and a downstream lean NO<sub>x</sub> catalyst, wherein the method includes determining an amount of NO<sub>x</sub> exiting the upstream oxidation catalyst, calculating a ratio of NO to NO<sub>2</sub> contained in said amount of exiting NO<sub>x</sub>, calculating an amount of reductant to be injected based on said amount of NO<sub>x</sub> and said ratio, and adjusting a signal for controlling injected reductant based on said calculated amount of reductant to be injected.

In contrast, Shafer-Sindlinger does not disclose at least the elements of calculating an amount of reductant to be injected based on an amount of NO<sub>x</sub> and a ratio of NO to NO<sub>2</sub> contained in the amount of NO<sub>x</sub>, and adjusting a signal for controlling injected reductant based on said calculated amount of reductant to be injected. Instead, Shafer-Sindlinger discloses in paragraph [0035] adding ammonia to an exhaust gas mixture in a NH<sub>3</sub>/NO<sub>x</sub> molar ratio of 0.6 to 1.6 before entrance to the reduction catalyst. This takes into account only the amount of NO<sub>x</sub> in the exhaust mixture, and not the NO/NO<sub>2</sub> ratio in the exhaust mixture, for the purposes of calculating an amount of reductant to be injected into the exhaust mixture. Therefore, for at least this reason, claim 1 is not anticipated by Shafer-Sindlinger, and is in condition for allowance.

### Rejections under § 103

Turning next to the § 103 rejections, applicants respectfully traverse the rejection of claim 2 as obvious over Shafer-Sindlinger. To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable

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expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

Claim 2 is not obvious over Shafer-Sindlinger for at least the reason that Shafer-Sindlinger, combined with the officially-noticed facts stated in the Office action, does not teach or suggest all elements of claim 2. For example, as described above for claim 1 (from which claim 2 depends), Shafer-Sindlinger fails to disclose calculating an amount of reductant to be injected based on an amount of NO<sub>x</sub> and a ratio of NO to NO<sub>2</sub> contained in the amount of NO<sub>x</sub>, and adjusting a signal for controlling injected reductant based on said calculated amount of reductant to be injected. Instead, Shafer-Sindlinger adding ammonia to an exhaust gas mixture in a NH<sub>3</sub>/NO<sub>x</sub> molar ratio of 0.6 to 1.6 before entrance to the reduction catalyst. Because Shafer-Sindlinger does not disclose or suggest all elements of claim 2, claim 2 is not obvious over this reference, and is in condition for allowance.

Next, applicants also respectfully traverse the rejection of claim 6 as obvious over Shafer-Sindlinger in view of Ohsuga for at least the reason that this combination of references fails to disclose or suggest all of the elements of claim 6. Claim 6 recites, in part, a system for an exhaust gas system of a diesel internal combustion engine, wherein the system includes a controller for determining an amount of NO<sub>x</sub> exiting the upstream oxidation catalyst, calculating a ratio of NO to NO<sub>2</sub> contained in said amount of exiting NO<sub>x</sub>, and adjusting an amount of reductant to be injected by said reductant system based on said amount of NO<sub>x</sub> and said ratio.

In contrast, as discussed above in the context of claim 1, Shafer-Sindlinger fails to disclose calculating a ratio of NO to NO<sub>2</sub> contained in a determined amount of NO<sub>x</sub> exiting an upstream oxidation catalyst, and adjusting an amount of reductant to be injected based upon the said amount of NO<sub>x</sub> and said ratio. Instead, Shafer-Sindlinger discloses adding ammonia to an

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exhaust gas mixture in a  $\text{NH}_3/\text{NO}_x$  molar ratio of 0.6 to 1.6 before entrance to the reduction catalyst.

Furthermore, Ohsuga also does not disclose determining an amount of  $\text{NO}_x$  exiting an upstream oxidation catalyst, calculating a ratio of  $\text{NO}$  to  $\text{NO}_2$  contained in said amount of exiting  $\text{NO}_x$ , and adjusting an amount of reductant to be injected by said reductant system based on said amount of  $\text{NO}_x$  and said ratio. Therefore, because the combination of Shafer-Sindlinger and Ohsuga fails to disclose or suggest all of the elements of claim 6, claim 6 is not obvious over this combination of references. Furthermore, claims 8-10 depend from and include all of the elements of claim 6, and are therefore also not obvious over either Shafer-Sindlinger alone, or the combination of Shafer-Sindlinger and Ohsuga.

Next regarding claim 23, applicants respectfully traverse the rejection of claim 23 as obvious over Shafer-Sindlinger and Ohsuga. Nevertheless, applicants herein amend claim 23 to recite a system for reducing exhaust gas  $\text{NO}_x$  of a diesel internal combustion engine, the system including a fueling system coupled to the engine for providing diesel fuel for combustion that includes sulfur; an upstream oxidation catalyst for converting a first portion of incoming  $\text{NO}$  into  $\text{NO}_2$  in the combustion gas to provide an exiting  $\text{NO}$  to  $\text{NO}_2$  ratio of within 50% of a 1:1 molar ratio; a downstream lean  $\text{NO}_x$  SCR catalyst for converting said a second portion of  $\text{NO}$  and  $\text{NO}_2$  exiting said upstream oxidation catalyst in the presence of a reductant; and a controller for determining and adjusting an amount of reductant to be injected between said upstream and downstream catalyst based on an estimate of an actual  $\text{NO}$  to  $\text{NO}_2$  ratio.

Claim 23 as amended is not obvious over the combination of Shafer-Sindlinger and Ohsuga for at least the reason that the combination of references does not disclose or suggest all of the elements of claim 23. For example, the combination of Shafer-Sindlinger and Ohsuga

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does not disclose a controller for determining and adjusting an amount of reductant to be injected between said upstream and downstream catalyst based on an estimate of an actual NO to NO<sub>2</sub> ratio. Shafer-Sindlinger merely discloses adding ammonia to an exhaust gas mixture in a NH<sub>3</sub>/NO<sub>x</sub> molar ratio of 0.6 to 1.6 before entrance to the reduction catalyst, and does not disclose or suggest controlling and adjusting the amount of ammonia in any manner. Therefore, because the combination of Shafer-Sindlinger and Ohsuga does not disclose or suggest all of the elements of claim 23, claim 23 is not obvious over this combination of references.

Obviousness-type double patenting rejections

In response to the obviousness-type double patenting rejections, applicants submit a terminal disclaimer herewith.

Conclusion

Based on the foregoing comments, the above-identified application is believed to be in condition for allowance, and such allowance is courteously solicited. If any further amendment is necessary to advance prosecution and place this case in allowable condition, the Examiner is courteously requested to contact the undersigned by fax or telephone at the number listed below.

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Please charge any cost incurred in the filing of this Amendment, along with any other costs, to Deposit Account No. 06-1510. If there are insufficient funds in this account, please charge the fees to Deposit Account No. 06-1505. A duplicate copy of this sheet is enclosed.

## CERTIFICATE OF FACSIMILE


I hereby certify that this correspondence is being sent via facsimile to the U.S. Patent and Trademark Office at (571) 273-8300 on July 19, 2005.

  
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Respectfully submitted,

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